

Math 242

Q5/ (3.6 #9)

$$f(x) = \frac{x^3 + x^2 + 8x + 1}{x^3}$$

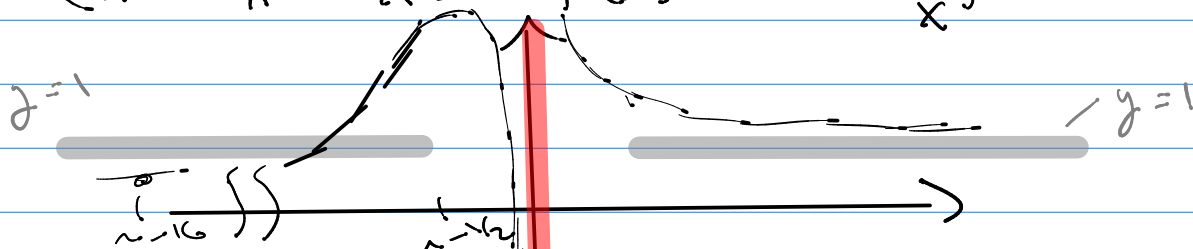
$$f(x) = 1 + x^{-1} + 8x^{-2} + x^{-3}$$

$$f'(x) = -x^{-2} - 16x^{-3} - 3x^{-4}$$

$$f''(x) = 2x^{-3} + 48x^{-4} + 12x^{-5}$$

$$f'(x) = \left(\frac{x^2}{x^4} + \frac{16x}{x^4} + \frac{3}{x^4} \right)$$

$$f''(x) = 2 \frac{x^2 + 24x + 6}{x^5}$$



$$x^2 + 16x + 3 = 0$$

$$C_{1,2} = \frac{-16 \pm \sqrt{16^2 - 12}}{2}$$

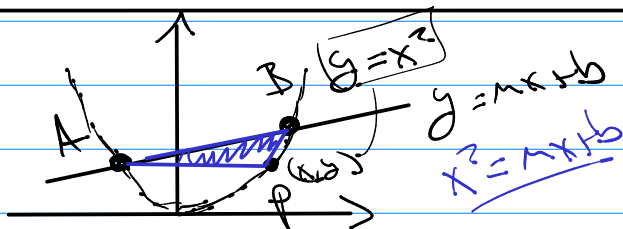
$$C_1 = \frac{-16 + \sqrt{16^2 - 12}}{2} \approx 7.5$$

$$f(C_1) =$$

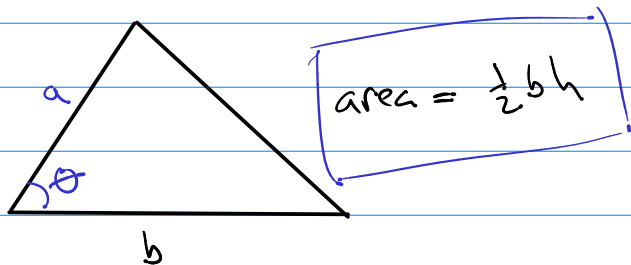
$$f(C_2) =$$

(See video)

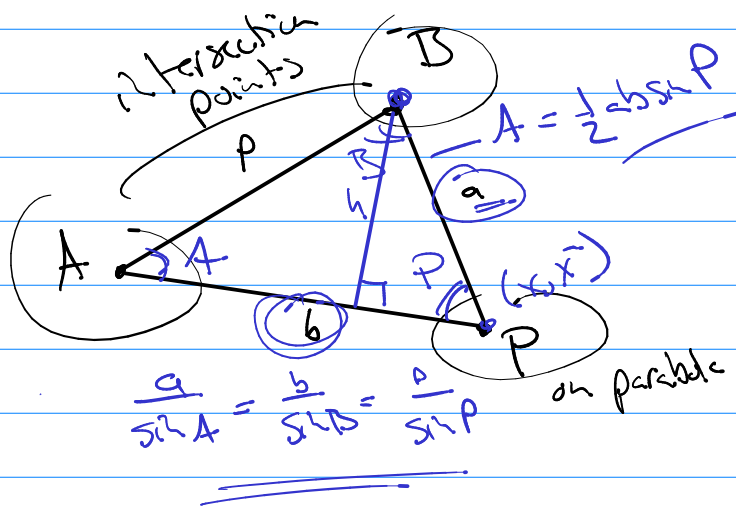
(ex)



Maximize area of $\triangle ABP$



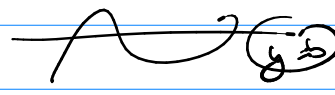
$$A = \frac{1}{2} ab \sin \theta$$



ex $y_1 = x^4 + cx^3 + 12x^2 - 5x + 4$

values of c so that $y_2 = b$ intersect y_1 times.

intersect $\rightarrow y_1 = y_2$



$$x^4 + cx^3 + 12x^2 - 5x + 4 = b$$

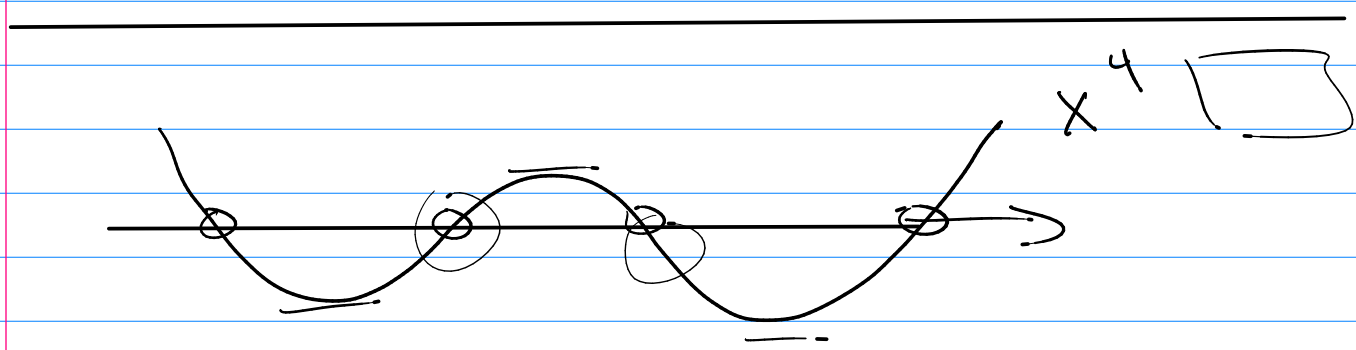
$$x^4 + cx^3 + 12x^2 - 5x + 4 - b = 0$$

$f(x) > 0$
 $f(x) < 0$

$b=1$

$$x(x^3 + 12x - 5) = 0$$

$x=0$



$$y = mx + b$$

$$f(x) = x^4 + cx^3 + 12x^2 - (5+m)x + (4-b)$$

$$f'(x) = 4x^3 + 3cx^2 + 24x - (5+m)$$

$$f''(x) = 12x^2 + 6cx + 24$$

zeros of $f''(x)$ are $\frac{-6c \pm \sqrt{(6c)^2 - 4(12)(24)}}{2(12)}$ need to verify.

Ch 3 Exam

21 probs @ 10 pts
200 pts = 200%

3.1 Abs. Extrema on closed intervals.

[2 probs]
 (1) given $f(x)$ on $[a, b]$
 (2) abs max is ? at ?
 abs min is ? at ?

factoring example

$f(x)$
 $\rightarrow f'(x) = x^3 - 4x^2 + x - 4 = 0$
 $x^2(x-4) + (x-4) = 0$
 $(x^2+1)(x-4) = 0$
 $x = \pm i$ $x = 4$

3.2 Mean Value Th^m [2 probs] (State the Th^m)

(1) given $f(x)$ on $[a, b]$
 (2) find an $x=c$ that satisfies M.V.Th^m

[3.3-3.5] [9 probs] ← 3 "tasks" & 3 "problems"

Graphing: $f(x)$
 → p1 $f(x)$: domain, asymptotes, intercepts, table
 → p2 $f'(x)$: criticals, inc/dec, rel. extrema, 1st deriv test
 → p3 $f''(x)$: inflection, concavity, extrema, 2nd deriv test

$f(x)$
 [(1) $f(x)$
 (2) $f'(x)$
 (3) $f''(x)$ graph
 (4) f_2
 (5) f_2'
 (6) f_2'' graph

graph
 f_3 [(7) f_3'
 (8) f_3''
 (9) f_3'' + graph

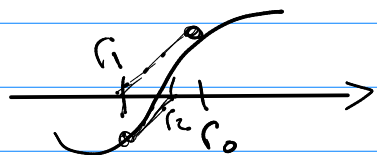
3.6 no problems

3.7 Optimization (2 word problems)

(1) geometric type (ex 3.7 (29, 16, 18))

(2) science type (3.7 (62, 45, 10))

3.8 Newton's Method



(2 probs)

(1) give you $f(x)$

(2)

you write $r_{n+1} =$

$$r_n - \frac{f(r_n)}{f'(r_n)}$$

← simplified

3.9 Antiderivatives (4 probs)

(1), (2), (3), (4)

$$Ax \left[\begin{array}{l} \text{gives} \\ \text{stuff} \end{array} \right] = ?$$

(ex)

$$Ax \left[\cos x - x^3 + x^{1/2} + \sec x \tan x \right]$$
$$= \sin x - \frac{1}{4}x^4 + \frac{2}{3}x^{3/2} + \sec x + C$$